

5.1 Groundwater Management Program

5.1.1 Introduction

Zone 7 has been actively monitoring and managing the groundwater basin for more than 30 years. Many of the various policies guiding the groundwater program were formalized in the 1987 Statement on Zone 7 Groundwater Management, incorporated herein by reference and included in Appendix E. This plan was partially revised and updated as part of the development of Zone 7's SMP, which was formally adopted by Zone 7 and approved by the RWQCB in October 2004; the SMP is also incorporated herein by reference and a copy of the Executive Summary is included in one of the Appendices. This Groundwater Management Plan serves to document the various existing groundwater management program components and how they are being implemented.

5.1.2 Salt Management

5.1.2.1 Background/Introduction

Zone 7's Salt Management Plan (SMP) was designed to comply with the requirements of the Master Water Recycling permit, RWQCB Order No. 93-159, issued jointly to Zone 7, the City of Livermore, and Dublin San Ramon Services District.¹ In May 2004, Zone 7, in cooperation with others, published the SMP to address the increasing level of TDS in the main groundwater basin. The SMP was approved by the RWQCB in October 2004. The SMP is incorporated herein by reference and a copy of the Executive Summary is included in Appendix D.

Zone 7 has define potential salt management strategies to offset the calculated long-term average salt loading to the main groundwater basin of approximately 2,200 tons per year.² The available alternatives are defined as those capital facilities and/or operational strategies already included in Zone 7's capital

¹ Zone 7 2004a.

² Zone 7 2004a.

improvement program or under evaluation in the Facilities Master Plan, and the Well Master Plan. In addition Zone 7 operates the groundwater basin conjunctively to remove salts as well as to maintain reliability of its supply.

Zone 7 has historically managed water deliveries and artificial stream recharge in accordance with its water supply operations planning program that consists of the following three major components:

1. Five-Year Demand Projections and DWR delivery scheduling;
2. Annual Water Supply and Storage Probability Analysis (also called the water supply forecast); and
3. Annual and Monthly Water Supply Operations Plans.

The Water Supply Forecast is prepared in December of each year for the following calendar year. The Water Supply Forecast shows how Zone 7 would operate to make full deliveries under a wide range of hydrologic conditions ranging from critically dry to extremely wet.

The Water Supply Forecast provides the framework for water management decisions. The Water Supply Operations Plans provide additional guidance for monthly supply goals (i.e., balancing surface and groundwater supplies). Each year in July, Zone 7 prepares preliminary versions of the Water Supply Operations Plans for the following three years. In September of each year, these three-year Water Supply Operations Plans are updated to reflect the latest demand requests received from Zone 7's retail water supply agencies. In January of each year, the Water Supply Operations Plan for the current year is updated with more accurate DWR water supply projections for most probable conditions. In April of each year, after DWR has announced the firm rest-of-year deliveries, Zone 7 develops a Monthly Water Supply Operations Working Plan. This Monthly Plan is then updated monthly for the rest of the year with actual year-to-date data and, as such, reflects adjustments made to meet water supply operational objectives.

The primary goal of historic water supply planning efforts was to minimize operations and maintenance costs by delivering the maximum amount of surface water available and pumping groundwater only to supplement surface water supplies during peak demand and drought periods. This historic approach successfully provided sustainable water supply at a minimum cost but did not specifically address salt loading, groundwater quality or delivered water quality.

The Water Supply Operations Plans now incorporate the Salt Management Plan (SMP) goals and an adaptive management approach to selecting the combination of salt management strategies to be implemented in a given year. Zone 7 determines the optimum combination of strategies to use in a given year. Multiple variables are balanced in making decisions and variables change from year to year, hence the need for a so-called adaptive or iterative management approach.

Factors used to track salt loading include data and information collected from the various monitoring programs described in Chapter 4. The existing monitoring programs are sufficient for tracking salt loading from existing sources and for existing land use conditions. Future land use changes and any increase used of recycled water may require additional monitoring to track the resultant additional salt loading. The monitoring component of the SMP facilitates tracking any progress in salt removal. No significant change is anticipated until groundwater demineralization begins (anticipated in around 2009).

5.1.2.2 Demineralization

To maintain delivered water quality (i.e., acceptable total dissolved solids or “TDS” and hardness) during future periods of increased groundwater pumping, Zone 7 has plans for constructing groundwater demineralization facilities.³ The primary advantages of wellhead demineralization are that significant salt loading benefits may be realized (by exporting the brine concentrate from the groundwater basin) while concurrently improving delivered water quality by lowering TDS and hardness. Depending on the capacity installed, wellhead demineralization allows one to “dial-in” desired delivered water quality (i.e., by adjusting flows between demineralization treatment unit and bypass to achieve target hardness and/or TDS levels) and to reduce seasonal and drought-related variability. The primary disadvantages of wellhead demineralization are the moderately high operations and management (O&M) costs for pumping energy and the costs for brine disposal.

Groundwater demineralization will also allow Zone 7 to pump from water-bearing zones containing higher levels of minerals (expressed as TDS and hardness). In addition, Zone 7 will be able to pump increased volumes of groundwater (taking advantage of “banked” water in the basin) without impacting delivered water quality.

Demineralization will use a reverse osmosis (RO) membrane-based treatment system producing product water with extremely low TDS. The demineralized water will then be blended with other groundwater (non-demineralized) and/or surface water prior to delivery to achieve a target delivered water TDS or hardness and to reduce aggressiveness to distribution lines. The brine concentrate from the RO process will be exported out of the watershed via the regional wastewater export pipeline operated by the LAVWMA.

5.1.3 Integrated Water Resources/ Conjunctive Use

Historically throughout California, surface water and groundwater have been managed as separate resources because water law treats groundwater and surface

³ Zone 7 2004a.

water as two separate resources. Such management does not represent hydrologic reality. As a result, DWR recommends monitoring surface water and groundwater resources as an integrated program that includes conjunctively managing groundwater with surface water.

DWR provides examples of planning efforts that should be integrated with groundwater management. These might include surface water flow/quality monitoring, wellhead protection management, agriculture/salt management, urban water management, flood management, and toxic site management.

For many years, Zone 7 has actively embraced a conjunctive use program by integrating management of local and imported supplies. Natural and artificial recharge utilizing releases of surface water to recharging streams is a key component of this program. To track the conjunctive use effort, Zone 7 actively monitors all of the following components:

1. natural inflow, including groundwater seepage (i.e., rising groundwater);
2. releases of imported water from the SBA;
3. urban run-off;
4. groundwater discharges from aggregate mining operations;
5. flood control releases from Lake del Valle; and
6. discharges from other artificial releases, including LLNL treated groundwater, well tests, or treated water discharges.

Zone 7 monitors the quantity and quality of each of the previous components. EC, pH, and temperature are measured monthly at stream-gaging stations throughout the basin and daily at various SBA turnouts to the Zone 7 treatment plants. The EC measurements are used to estimate TDS content using the formula $TDS = 0.56 \times EC$. Additionally, surface water samples are collected periodically and analyzed for major and total ion content.

5.1.4 Groundwater Resource Protection

Zone 7 considers groundwater resource protection to be one of the most critical components of ensuring and managing groundwater resources. This GMP identifies resource protection by preventing contaminants from entering the groundwater basin and remediation of existing contamination.

5.1.4.1 Protection of Supply

Zone 7 ensures adequate water supply by importing a large amount of surface water into the valley through the SWP. In 2004, Zone 7 had an annual maximum entitlement of 80,619 af/y. Zone 7 also has a contract with Byron-Bethany Irrigation District for an additional 2,000 acre-feet. Zone 7 has also purchased water storage rights (65 taf) in the Semitropic Water Storage District

groundwater basin located in south-central California near Bakersfield. Artificial recharge of available supply allows the main groundwater basin to remain above the historical low level with good quality water.

The natural supply of groundwater replenishment to the basin needs to be protected. Urban development can reduce the amount of water recharging the basin. If left unmitigated, the natural safe yield of the basin would decline. Zone 7 monitors the natural recharge and reviews development plans to evaluate any impacts on the recharge capacity of the basin.

Currently, the largest potential negative impacts to recharge are the operation of the Del Valle Dam and the extensive gravel mining activities. To mitigate the impacts of the construction of the Del Valle Dam, Zone 7 makes releases from below the dam to maintain the stream flow and recharge through stream beds that would have occurred had the dam not been constructed. These releases are called “Prior Rights Releases.” To satisfy these prior rights requirements, Zone 7 evaluates the Pre-Del Valle Dam (Pre-Project) and Post-Del Valle Dam (Post-Project) recharge. Recharge releases are made into the Arroyo Valle to ensure that the same amount of water recharges the basin as would have recharged if the dam had not been constructed.

Regional gravel mining activities have a significant impact on stream recharge and on the loss of groundwater through evaporation and mining company discharges to the arroyos. The Mining Area Reclamation Plan calls for the creation of a Chain of Lakes (see Section 3.3) that will allow the recapture of some of the lost recharge capacity associated with the mining impacts on stream recharge. In addition the Chain of Lakes project will mitigate the impacts from the increased evaporative losses associated with the creation of large lakes within the basin.

When all mining activities are completed in 2030 Zone 7 will own the Chain of Lakes area in fee and will utilize the chain of lakes for water resources management purposes to protect the natural recharge capacity of the groundwater basin and to mitigate the loss of groundwater from evaporation and reduced stream recharge capacity. In these ways, Zone 7 protects the natural supply of groundwater which is then used primarily by the retailers to provide the water that they appropriate from the groundwater basin.

5.1.4.2 Wellhead Protection/Permit Program

DHS administers the Drinking Water Source Assessment and Protection Program that requires the identification of wellhead protection areas. A DWSAP evaluation has been conducted for all Zone 7 supply wells and will be conducted for all future Zone 7 supply wells. The DWSAP identifies areas of protection for each wellhead area. These areas are incorporated into other Groundwater Protection Programs of Zone 7, as discussed elsewhere in this chapter.

Both the County and the three local cities (Dublin, Livermore and Pleasanton) have well ordinances, all of which are administered by Zone 7 Water Agency by agreement. As a result of these Well Ordinances, any planned new well construction, soil-boring construction, or well destruction must be permitted by Zone 7 before the work is started. There is currently no fee for the Zone 7 permits. Additionally, all unused or abandoned wells must be properly destroyed, or, if there are plans to use the well in the future, a signed statement of future intent must be filed at Zone 7.

A copy of the Zone 7 drilling permit applications is available for download from the Zone 7 website. Zone 7 must receive permits at least 5 days prior to beginning any drilling. Well construction/ destruction permit requirements are determined on a case-by-case basis but generally follow DWR's California Well Standards (Bulletins 74-81 and 74-90).

5.1.4.3 Water Conservation

Because water is a limited and precious resource that must be used wisely, Zone 7 makes water conservation an integral part of its daily operations and water management approach—not just an emergency response to recurring droughts.

Zone 7 promotes the Ultra-Low-Flow Toilet Rebate Program, which began in 1994, and is a water conservation success story for Zone 7 and Tri-Valley households. The program offers rebates to households when they replace their old toilets with new water-conserving ultra-low-flow toilets. Almost 11,000 ultra-low-flow toilets have been installed in the valley, for an annual water-savings of 480 acre-feet. Each ultra-low-flow toilet will save an estimated average of 38 gallons per day.

Zone 7 also promotes the Residential Clothes Washer Rebate Program, which involves the purchase of high-efficiency, Energy Star® labeled clothes washing machines. These high-efficiency washing machines use up to 50% less energy and up to one-third less water relative to most other new washers. Zone 7 has given out approximately 4,000 rebates since this program began in 1998. This program is a regional partnership with other Bay Area water agencies, including Alameda County Water District, Contra Costa Water District, East Bay Municipal Utility District, and Santa Clara Valley Water District.

5.1.4.4 Wastewater Management

Zone 7 Board of Directors adopted an interim policy on wastewater reclamation (Resolution No. 823, 1977) and a “Wastewater Management Plan for the Unsewered, Unincorporated Area of Alameda Creek Watershed Above Niles” (WMP) (Resolution No. 1037, 1982). (See Appendix E.) The 1982 WMP encompasses the unsewered, unincorporated area above Niles situated outside the sewer urban areas in the Livermore-Amador Valley. The primary purpose of this WMP was to identify, assess, and recommend solutions to local septic tank

problems, and recommend wastewater management policies to prevent degradation of surface waters and groundwater.⁴ The recommended policies of the WMP were adopted along with the WMP, itself, by the Zone 7 Board of Directors in Resolution 1037 (see Appendix E). Among the most important is B.4 in the WMP: “If more intense development proposing septic tanks is to be authorized in any area and/or when land use zoning is changed to rural residential use with septic tanks: (a) the minimum generally acceptable lot size should be five (5) acres.”

A separate policy was established that prohibits the use of septic tanks for new developments zoned for commercial or industrial uses (Resolution No. 1165, Appendix E). This prohibition can be waived by the Zone 7 Board if “it can be satisfactorily demonstrated to the Board that the wastewater loading will be no more than the loading from an equivalent rural residential unit and said septic tanks will be in compliance with all other conditions and provisions.”

These policies have been adopted in large part to protect the groundwater basin from contamination from untreated sewage. For many years Zone 7 has been monitoring a persistent plume of high nitrate concentrations in the Main Groundwater Basin that extends from south Livermore six miles northeast to Livermore’s airport. A preliminary study was conducted in April, 1980. Nitrate concentrations within this plume typically range from 30 mg/l to 65 mg/l and have been somewhat stable for the last three decades or more. The drinking water standard or maximum contaminant level (MCL) for nitrates (as nitrate or NO₃) is 45 mg/l. CWS operates several municipal supply wells within the affected area, however, the well water that contains nitrates greater than the MCL is blended with imported water to lower the nitrate concentrations below the MCL prior to distributing it to their customers.

In 2002, Zone 7’s consultant, Raines, Melton & Carella, Inc. (RMC) conducted a reconnaissance level evaluation of the nitrate sources which may be responsible for the high nitrate concentrations found in the South Livermore area. In general, in this draft report RMC concluded that the rural residential livestock manure and septic tank leachate provide over 90% of the current nitrate loadings in the study area which was comprised of 670 acres of agricultural land and rural residential area. The study area is upgradient of the affected CWS wells, and currently includes approximately 100 rural homes along Buena Vista, Almond and East Avenues and Calvary Lane that use septic tank systems for sewage disposal. The majority of the homes are on Buena Vista Avenue. In addition, there are six wineries (including one with a full-scale restaurant), commercial and private horse stables, a dog kennel and approximately 460 acres of vineyards within the study area. Historically, there was extensive chicken and row crop farming along Buena Vista Avenue that continued until the 1950s.

RMC evaluated the potential nitrogen sources in the study area. Nitrogen loadings and losses from multiple sources were estimated to determine a net mass balance for nitrogen entering the groundwater. The volume of water recharged to the groundwater basin was estimated to determine the resulting concentration of

⁴ Camp Dresser and McKee 1982.

nitrate in the groundwater. The nitrogen mass balance model predicts that livestock manure is providing 50–55% of the current nitrate loadings within the study area and that septic tank leachate is providing 40–45%. On the other hand, the nitrate contributions from winery process wastes and urban and agricultural fertilizers make up less than 10% of the total.

Zone 7 continues to work with the City of Livermore, Alameda County Planning Department, the Buena Vista and Almond Avenue residents and the property and business owners along Tesla Road, to develop strategies to mitigate the regional nitrate issues.

Recycled Water Use

Overall it is anticipated that use of recycled water for irrigation purposes will increase in the future. Within the Zone 7 service area, two retail water supply agencies (DSRSD and the City of Livermore) plan to use or are currently using recycled water for the following projects:

- **Livermore Golf Course**—The Livermore Airport and Golf Course use about 400 acre-feet of recycled water annually for irrigation. The current monitoring program consists of 10 wells installed jointly by Zone 7 and the USGS in the late 1970s. The collection and analysis of groundwater data were initially done by the USGS and Zone 7, but the collection was taken over by the City of Livermore in 1985. The RWQCB established monthly monitoring and reporting requirements in Water Reclamation Permit No. 90-102 issued to the Livermore Water Reclamation Plant. The requirements in Permit No. 90-102 were superseded in January 2005 when the RWQCB issued Livermore General Order 96-011. Order 96-011 does not contain groundwater monitoring requirements. However, Livermore continues to support Zone 7 in collection and analysis of groundwater samples. In 2003, four additional shallow monitoring wells were installed and are monitored by Zone 7 to help evaluate the effect of the recycled water use on groundwater. Three of the wells are located at the Livermore Golf Course, one upgradient of the irrigation area (to establish background water quality conditions) and the others downgradient. Zone 7 reviews the groundwater quality data submitted by the City of Livermore to the RWQCB and makes additional water level and groundwater quality measurements. Zone 7 maintains records on monthly recycled water use, recycled water quality, and the application areas and rates.
- **Public Parks**—It is recommended that two shallow wells be constructed at a large park, such as the Pleasanton Sports Park, Dublin Sports Grounds, or Emerald Glen Park, that is irrigated with recycled water. One upgradient well would monitor background conditions and the other downgradient well would monitor the effects of irrigation with recycled water. The wells would be monitored quarterly for approximately 1 year and then annually once baseline conditions were established.
- **Veterans Administration Hospital**—The Veterans Administration (VA) Hospital wastewater treatment system and percolation ponds are located at

the southern edge of the Main Basin. This system is also regulated by RWQCB Waste Discharge Requirements that include groundwater monitoring and reporting requirements. For consistency and completeness, it is recommended that the existing requirements be reviewed to evaluate the usefulness of the information being collected. As appropriate, recommendations could then be made for monitoring changes to best document the current and future impacts of percolation on groundwater quality.

5.1.4.5 Toxic Site Management

Background

Zone 7 documents and tracks sites across the groundwater basin that pose a potential threat to drinking water. Information on these sites is gathered from state, county, and local agencies, as well as from Zone 7's well permitting program. This tracking program is designated the "Toxic Site Surveillance Program" and a report is generated biannually to update the progress of investigations and clean-ups. Each site has been assigned a Zone 7 number, which corresponds to the file number containing reports or other information about the site. In addition, all sites are reviewed and given a ranking based on criteria used by the RWQCB and Alameda County Environmental Health (ACEH) that have been modified to meet Zone 7 standards.

Program Description

A GIS database and map was developed to show the locations of these sites and to provide basic information including; priority, status, owner/contact, contaminants of concern, concentrations of contaminants in groundwater, proximity to supply wells, lead agency and date last reviewed. This database is maintained by Zone 7 staff to help assess the potential threat to our drinking water posed by a given site.

Each site is assigned a priority designation of high, moderate or low. The priority can change as conditions change at the site. A site is designated as a high priority site if the following conditions occur:

1. contamination at the site is in groundwater at concentrations greater than the MCL, and
2. a water supply well is within 2,000 feet downgradient of the site, or
3. it is shown that drinking water will likely be impacted by the contamination at the site.

A secondary ranking is used to represent the remedial status of the site. These codes differ slightly from those used by ACEH and RWQCB to better meet the needs of Zone 7. For example, a closed case is listed as a Status "CL" in the Toxic Site program database, instead of the RWQCB's code of "9".

In general, the Toxic Site Surveillance Program has found two types of contamination threatening groundwater in the Livermore-Amador Valley Groundwater Basin: fuels and industrial chemicals

The petroleum-based fuel products include total petroleum hydrocarbon as gasoline (TPHg), TPH as diesel (TPHd), benzene, toluene, ethylbenzene, xylene (collectively known as BTEX), and oxygenates added to fuel including methyl tertiary-butyl ether (MtBE) and tertiary-butyl alcohol (TBA). California has assigned clean-up standards for the BTEX compounds and fuel oxygenates. However, a cleanup standard for total petroleum (TPHg or TPHd) has not officially been established.

The industrial chemical contaminants of concern are tetrachlorethylene (PCE), trichloroethylene (TCE), and their by-products and degradation products. This latter group of contaminants consists of chlorinated solvents. PCE is common in the dry cleaning business, and TCE is commonly used as a degreaser for electronics. Both PCE and TCE have an established MCL of 5 micrograms per liter (µg/l).

Zone 7 is currently tracking 76 active sites where contamination has been detected in groundwater across the groundwater basin. Ten of these sites are designated as high priority, five in Livermore, four in Pleasanton, and one in Sunol.

When there are sites that are of particular concern and/or are a potential threat to the drinking water supply staff will work closely with the lead agency (RWQCB or ACEH) to ensure that Zone 7's concerns are addressed.

Reporting

A report is generated biennially to update the status of the sites in the program. This report is submitted to the Zone 7 Board. The report includes a detailed summary of the background information of each high priority site along with any special notes and the current actions taking place at the site. In addition, a summary table of all the active sites is included in the biennial report. This table includes a brief summary of the current status of each active site. A map is generated for each main area within the groundwater basin, Livermore, Pleasanton, and Dublin, to show the site locations, their priority and their proximity to municipal supply wells (Figures A, B, and C in Appendix B).

5.2 Future Review of This Groundwater Management Plan

This GMP is the framework for regionally coordinated groundwater management efforts within the Livermore-Amador Valley. Many of the components described in this GMP will likely further evolve with future management efforts in the

basin. Any such future changes will involve a collaborative effort involving Zone 7 and its four agencies (Dublin-San Ramon Services District, City of Pleasanton, City of Livermore and California Water Service Company), as well as the Tri-Valley Retailers Group, in which all four retailers participate. Key resources for evaluation are the annual monitoring and measurement reports described above. As a result, the GMP is intended to be a living document, where the components will be evaluated over time to determine whether they are meeting the overall goal of the plan, and revisions will be proposed and adopted, as appropriate.

5.3 Public Hearings and Plan Adoption

- Interim GMP presented at public meeting to Zone 7 Board in 1987.
- Original Groundwater Management Program adopted in 1987 following hearings, contributions from stakeholder-based groundwater advisory committee, etc. (“Statement on Zone 7 Groundwater Management,” 8/19/87.)
- Groundwater Management Advisory Committee (GMAC) formed primarily in relation to the demonstration RO/groundwater injection project; however also assisted in evaluating the 1987 Statement on Zone 7 Groundwater Management and helping develop and review the salt management elements of a new plan reflected in the eventual adoption of the Salt Management Plan. (10 Citizen effort 1995–2002.)
- Salt Management Plan Outlining Conjunctive Use to Enhance Groundwater Quality (adopted by Zone 7 with stakeholder input via public interest group, the GMAC, as well as a Technical Advisory Group, discussions at public meetings and subsequent approval by RWQCB in October 2004).
- January 2004 Zone 7 Board notice of plan to review Groundwater Management Plan in a series of three public presentations.
- February, April, and August 2004 public presentations on groundwater basin supply, quality, and management.
- July 2005 distribution of Administrative Draft Groundwater Management Plan to Retail Water Agencies to solicit preliminary comments and input.
- August 3, 2005 meeting with retail water agencies (DSRSD, CWS, Livermore and Pleasanton) to review Administrative Draft Groundwater Management Plan.
- August 17, 2005 public hearing followed by adoption of Resolution of Intent to Adopt Groundwater Management Plan, completion of Draft Groundwater Management Plan and opening of public review and comment period (draft plan was made available to the public in area libraries and on the Zone 7 website), with all associated publications of notice.
- Receipt of comments followed by revisions to Draft Groundwater Management Plan to reflect input received.

5.4 Actions

The Zone 7 Board of Directors will be asked to adopt the Groundwater Management Plan following a public hearing at the September 21, 2005 Regular Board Meeting, following all required publications of notice.